

# Rural Farm and Non-farm Linkages in a Predominantly Manufacturing Region: The Case of Semarang Regency, Indonesia

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**Abstract** This paper aimed to explore the correlation between the agricultural and non-agricultural sectors in the rural area affected by the manufacturing industry agglomeration of Semarang. Data on agricultural commodities, non-agricultural labor, and economic service facilities were reduced using factor analysis to form the typology of agricultural commodity areas and typology of rural diversification respectively. The two groups of score factors were correlated to predict the magnitude, direction, and significance of the inter-sectoral linkages. Data interpretation was made with the help of agricultural commodity flow data from the selected market. The study confirms the weak linkages between large-scale manufacturing industries and the agricultural economy in the hinterland. The study reflects weak linkages between the agricultural sector and rural diversification, as indicated by the weak correlation between factor scores. A rather strong linkage is shown by dryland agricultural areas associated with inland fisheries and rural diversification associated with tourism.

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## 1. Introduction

The industrial era had changed so many aspects of all livelihoods. It happens all over the world. Rural industrialization in developing countries such as in Indonesia was initially considered successful in reducing unemployment in rural areas, stemming the flow of urbanization from village to city, increasing the livelihoods and welfare of rural population (Sayogyo, 1993; Ajayi, 2004). At the next stage of development this idea reaped a variety of criticisms, including industrialization not based on the agricultural and non-agricultural sectors in rural areas, shifting the role of home industries and small industries, and impacting unemployment (Solahuddin, 2009). Based on the United Nations Statistics Division data per 2016, Indonesia ranks fourth out of 15 countries in the world whose manufacturing industry contributes significantly to Gross Domestic Product (GDP). Indonesia contributes more than 22 percent and is ranked after South Korea (29 percent), China (27 percent), and Germany (23 percent). A large-scale industry with modern technology, based on import substitution, capital-intensive investment, generally uses raw materials from outside the region, while industrial products for external needs and exports. So far, the policy has favored the import-based industry (Maksum, 2009; Solahuddin, 2009).

Semarang Regency, as a well-known manufacture indus-

trial area in Central Java Province, is a fit area to be studied. Many of the manufacturing establishments in the Semarang Regency are footloose in nature that there are very limited linkages to farm and non-farm sectors in its hinterlands. The villages in the hinterlands of manufacturing agglomeration like Semarang is only a place of activity or industrial location, or just as a locus without enjoying the linkages with the operating industry in the agglomeration zone and even experiences leakages (Saith, 1989). Large-scale manufacturing industries cause no development of linkages due to they are footloose, and in the long term, is seen as less stable and potentially disturbs the balance of foreign exchange (Solahuddin, 2009).

The mechanism of linkages between the agricultural and non-agricultural sectors in rural areas is believed to be an important substance in rural development. Value-added from the agricultural sector is to be stemmed in rural areas through various processing activities. As Mellor (1976) suggested that the agricultural sector be put as a focus in rural development. Agricultural production, through the effects of linkages with the non-agricultural sector, can stimulate rural industrialization, open employment opportunities, and increase farmers' income and welfare. Increasing farmer income will increase the demand and purchase of manufactur-

ing goods. This perspective has formed the efforts of rural development since the 1970s until now. The related mechanism suggested by Mellor does not always occur in rural development, due to various reasons such as the absence of processing of agricultural production in each village. Agricultural commodities such as vegetables, fruit, fish, and livestock produced in the village are taken out of the village and marketed without processing so that the added value of products is enjoyed by other regions that utilize these agricultural commodities.

Semarang Regency as an area dominated by a manufacturing economy in the forms of medium and large scale industries shows a paradoxical situation because the existence of large and medium scale manufacturing industries that form large agglomerations has proven to not provide adequate contributions to rural economies through intersectoral linkages (Hardati, 2014). As a result, even though the contribution of the industrial sector to the regional economy can be considered relatively high (38.10 percent) compared to other regions, but this regency still experiences moderate poverty rates (7.78 percent). The presence of the leading economic sector of the manufacturing industry combined with some poverty rates reinforces the idea of the absence or lack of the linkage mechanisms between production in the manufacturing industry sector and the agricultural sector in rural areas. This can be partly explained by the characteristics of large and medium scale industries operating in this area that have properties not dependent on locally produced raw materials. The research of Pangarso (2019) confirms that the manufacturing sector in Semarang agglomeration has developed on footloose industries with limited linkages to the rural economy of the region. The existing predominant manufacturing industries are related food and beverage, garment, non-metal mining industries and furniture with a very limited linkage to its hinterlands. As a result, even though there is an agglomeration of manufacturing industry activities in this district, there is no direct impact on the rural agricultural due to the absence of a linkage mechanism in the production process.

The high poverty rate in the Semarang Regency region is also allegedly a result of the absence of functional linkages between the agricultural and the non-agricultural sectors in rural areas. Agricultural commodities produced in research areas such as vegetables, flowers, and fruits have characteristics that are perishable, thus placing farmers in a weak bargaining position in marketing their agricultural commodities. Farmers are forced to accept low prices, so they cannot get sufficient income to develop their businesses and some even fall into situations of poverty. Thus, one of the possibilities to improve the farmer's incomes is through the development of farm and non-farm linkages in which the durability of agricultural commodities is improved through processing activities. Opportunities for the linkages between the agricul-

tural and non-agricultural sectors are actually still wide open, namely between the agricultural and non-agricultural sectors at the local level in rural areas of the Semarang Regency. Agricultural commodities harvested by the farmers are directly marketed elsewhere without significant processing that the value-added of the commodities go to the places where they are marketed. The smallness of the existing farm size leads to a small amount of harvest that does not permit further processing simply because of the diseconomy of scale. Rural-urban linkages that trade agricultural commodities are empirically proven to exploit the rural asymmetrically, the question that arises is how the potential linkages between the agricultural and non-agricultural sectors between villages to other villages (rural to rural linkages) are important sources of rural development.

In addition, in the past decade, there has been a new trend in the study of the linkages in rural production sectors, especially in rural to rural linkages, given the fact that rural-urban linkages are not always working as expected in rural development. Rural to rural linkages in various studies have been carried out by covering various fields related to climate change induced migration (Hossain and Haq, 2010; Kubik, 2017), increasing people's preference to live in more comfortable rural areas (Bosworth & Venhorst, 2018 and Feng and Patton, 2016), empowerment of rural areas (Directorate General for Agriculture and Rural Development of the European Commission, 2015), obtain better livelihoods (Majule et al, 2013), home-based business development (Ofosuhen, 2005), rural diversification that utilizes local resources (Rijanta, 2006), market access for farm and non-farm employment (Smith, 2003), agricultural input procurement and agricultural commodity marketing (Tadele et al., 2006), rural to distressed rural migration (Black et al, 2008), rural to rural migration (FAO IFAD IOM WFP, 2018).

This study aims to explore the relationship between the agricultural and non-agricultural economic sectors in Semarang Regency in order to explain the occurrence of poverty in this area. Classification of regions of agricultural commodities was prepared based on the combination of commodities using factor analysis. Likewise, in various non-agricultural economic activities carried out in the village were categorized using factor analysis. The relationship between the two groups of factors from available agricultural commodities and agricultural activities carried out in all villages were used as a measure of the occurrence of functional inter-village linkages. Interpretation and understanding of the results of the analysis were assisted by the data on spatial dynamics of the flow of agricultural commodities which occur within the regency and the flow of agricultural commodities outside the region. Weak relations between the agricultural and non-agricultural economic sectors within regency at the village level are indicating low rural to rural linkages and being one of the causes of poverty.

## 2. The Methods

This study utilized 2011 Village Potential (Podes) data from the Statistical Board of Semarang Regency (BPS) data, and field survey data on commodity flows at the location of focal points in the trade of agricultural commodities in Semarang Regency. Village potential data was collected annually at the village level. This set of data permits a data analysis at the village level. To illustrate the linkages between the agricultural and non-agricultural sectors, there were 82 variables measured at the village level for the entire district. Given a large number of variables available from the data, there was a need to reduce and simplify the data using factor analysis so that the results were more easily observed and interpreted. The data processing steps is given in Figure 1.

In total, there were 69 variables from the Podes available to describe the agricultural commodities of the regency (see Annex 1). They were grouped into eight sub-sectors, namely food crops of six commodities, fruits of 17 commodities, vegetables of 17 commodities, gardens/smallholder crops of 10 commodities, upland crops of 4 commodities, livestock of 6 types of animals, poultry of 4 kinds of animals, and inland fisheries of 5 kinds of fish. These variables were reduced using factor analysis techniques, to form new, simpler groupings along with factor scores obtained for each factor in each village.

Variables of non-agricultural activities consisted of 13 units, which consisted of the number of establishments and the number of workers from large and medium-scale industries, small and household industries, trade, services, and tourism-related services. These variables were also analyzed using factor analysis to obtain more meaningful groupings of villages so that scores were obtained for each factor and village. Furthermore, the factor score data of non-agricultural activities for each village were correlated with factor score data of agricultural commodity regions in the same unit of analysis, so that the correlation figures, signs and significance of the correlation between the two groups of factors were obtained. This figure, sign and significance was used to describe the linkages between the agricultural sector and the non-agricultural sector in the regency. The results of the correlation analysis were then interpreted with the help

of the results of field surveys of commodity flows between villages within the regency and between Semarang Regency and other regions. Visually the data analysis process is presented in the picture as follows.

## 3. Result and Discussion

Agricultural and non-agricultural sectors show different characteristics in rural areas of the Semarang Regency. As it also occurs elsewhere, agricultural sectors are supply-side, so they are very sensitive to changes in the patterns of land ownership, the average area of agricultural land, the use of production facilities and the length of irrigation channels and capital, while non-agricultural more demand-side activities, which are very sensitive to changes in income level (Booth, 2002). Linkages between agricultural and non-agricultural sector have attracted a lot of attention among scholars dealing with rural development for many decades. Agricultural and non-agricultural linkages can be studied in various levels of observation using different variables. Agricultural and non-agricultural linkages were studied at the regional scale (Booth, 2002; Rello and Morales, 2002), and using per capita income as the main indicator (Haggblade et al., 1989). A more detail study on farm and non-farm sector linkages was conducted by Rijanta in Yogyakarta Province (2006) at the household level in which the correlation between non-farm incomes and expenditure in farm inputs were used as a measure of linkages.

The synergistic linkage between farm and non-farm side of the household economy was also reported in Thailand (Poapongsakorn, 1994). The agricultural sector was reported as a major factor in the emergence and growth of rural non-farm activities and employment through a linkage mechanism. This is not the case of our finding as weak linkages from the agricultural sector are known. Lessons from Thailand above shows that if the growth is positive, backward and forward links generate higher productivity non-farm jobs. If agricultural growth is weak, it is also a push for low-productivity non-farm jobs. Thus, at the household level of access to land is one of the main determinants of factors leading to participation in non-farm activities. The motivation behind the growth of rural non-farm activities is a mix between survival and accumulation of wealth for the better off-farming households. It is also reported by Poapongsakorn (1994) that demand links between the agricultural sector and the output of the manufacturing sectors are not very substantial. One percent increase in agricultural incomes induces 0.2 percent of manufacturing output in Thailand.

Our study measures the linkages between agricultural and non-agricultural activities using the proxy for the existence of types of agricultural commodities in the village and the diversity of non-agricultural activities carried out by

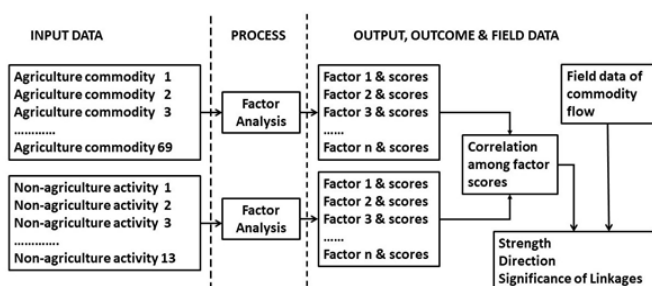


Figure 1. Schematic Presentation of the Process of Data Analysis.

the community in all villages in Semarang Regency. The strong linkages between the agricultural sector and non-agricultural activities occur if various agricultural commodities in every village in the regency are able to be transported, traded and processed by the community in the same village so that new economic activities emerge within the village that also lead to sustainability. For this reason, the correlation between the factor scores of the existence of agricultural commodities and factor scores of non-agricultural economic activities in each village is used as a measure that shows the magnitude, direction and significance of the linkages between the respective economic sectors. The magnitude of correlation shows the strength of the linkages, signs of correlation shows the direction of linkages.

The process of data reduction using factor analysis of 69 variables from 235 villages in the group of agricultural commodities in the Semarang Regency resulted in 4 factors that can explain about 67.89 percent of the variants, about 32 percent of which were explained by variables not included in this study. The four factors along with the names, names of the main commodities and details of their variants, are presented in the table as follows.

The results of data reduction using factor analysis on 13 variables regarding non-agricultural economic activities in the study area resulted in 4 meaningful data groupings with variance magnitude, main activities, and factor names presented in the following table. From the table, it can be observed that the four factors resulting from the analysis are able to explain about 69.82 percent of the variance, while the rest is explained by variables outside the scope of this study.

The factor scores data of the types of agricultural commodity regions for the whole 235 villages were correlated with the types of rural diversification. To obtain the proper correlation, all the factor scores were correlated in the same unit of analysis. This correlation figure, sign, and significance were used to describe the relationship between the agricultural and the non-agricultural sector in the regency. Based on the results of the correlation analysis, it can be explained that there were weak functional linkages between the factor scores of the agricultural commodity region and the factor scores of types of rural diversification with various magnitude, direction, and significance of correlation values. The weaker correlation, the more values is close to or even having a negative sign (the values range from about 1 to -1). The slightly high functional linkages only

Tabel 1. Types of Agricultural Commodity Regions in Semarang Regency, 2011

Factors code	Percent of Variance Explained	Variable loads	Name of factors
1 AC	22.89	Dryland agriculture, plantation, horticulture and ruminants	Dryland agriculture associated with ruminants
2AC	16.40	Wetland agriculture, fruit crops and food crops	Wetland agriculture for fruit crops and food crops
3AC	14.56	Garden crops and inland fishery	Dryland agriculture combined with inland fisheries
4AC	14.01	Poultry	Dryland agriculture and poultry

Source: Factor Analysis, 2014.

Table 2. Types of Rural Diversification in Semarang Regency in 2011

Factors	Percent of Variance Explained	Variable loads	Name of factors
RD1	22.68	Number of workers and establishments of medium and large-scale manufacturing industries	Rural diversification associated with medium and large-scale manufacturing industries
RD2	21.17	Number of workers and establishments of small scale and household industries	Rural diversification associated small-scale and household industries
RD3	14.37	Number of cooperative establishments, village cooperative establishments, banks, market places, traders, post offices, telecommunication shops	Rural diversification associated with services
RD4	11.60	Number of hotels, restaurants and tourist attractions	Rural diversification associated with tourism activities

Source: Factor Analysis, 2014.

occur between the factor scores of the agricultural commodity region of mixed dryland agriculture with inland fisheries with the factor scores of rural diversification associated with tourism. Weak functional linkages occurred in two components, first between the score factor of types of agricultural commodity of dryland agriculture and ruminant livestock with score factors of rural diversification associated with small-scale and household industry. Second, score factors of agricultural commodity regions of dryland agriculture mixed with ruminant and score factors of rural diversification associated with tourism (Table 3).

The table further confirms that there was very weak linkage between the existence of medium and large-scale manufacturing industries and the rural hinterlands. It is shown that the correlation between the score factors of rural diversification associated with medium and large-scale industries and factor scores of all types of agricultural regions is weak, negative, and insignificant from about -0.185 to 0.190 correlation value. This indicates that the large-scale manufacturing industries in the regency have limited or no functional linkages with their rural hinterlands. Farm establishments in the hinterlands are dominated by small farms. The smaller size and subsistent farms operated by the rural households are the main constrain to the development of farm and non-farm linkages to the existing manufacturing establishments at least for two reasons. First, the greater majority of farmers in the rural hinterlands are producing various agricultural commodities on a smaller scale for their subsistence only that marketable surplus is almost zero. There is no guarantee that the subsistent farmers in the hinterlands can provide raw materials for the medium and large-scale manufacturing industries continuously throughout the year. Second, the existing farm size and crops grown have been adjusted to the local circumstance in which farmers schedule their harvest

regularly to guarantee a continuous farm income throughout the year.

The lack of linkages between farm and non-farm side of the rural economy in the rural hinterland also related to the way in which the agricultural commodities are treated at the farm level. Almost all agricultural products are not processed but are sold directly to the market or picked up by middlemen at the farm gate. This is the case of all agricultural commodities such as ruminants, poultry, various types of fish, various crops, fruits, and vegetables. Most agricultural commodities from the rural Regency of Semarang, including vegetables, are intended to be consumed in a fresh form that it may not be processed before being marketed. In addition, some of the commodities such as decorative flowers are fragile and voluminous that it requires special treatment in packaging and transport to the market. The lack of capacity of farmers to deal with the specific characteristics of such commodities has led most households to sell their agricultural products directly at the farm gate or in the local market.

Rural diversification associated with trade and services has no functional relevance to the agricultural sector. These trade and service activities do not occur in all villages as there is no trade and service infrastructure. In Semarang Regency, there are only two vegetable and livestock markets at present. Additionally, of the 235 villages, there are only 30 traditional markets. Some of the traditional markets do not operate according to their schedule anymore as there are many private modern stores newly operated around the location of traditional markets. At the same time, there is a strong tendency to change in the preference of households in shopping from traditional markets to modern stores. This new competitor leads to the inability of the local service centers to function normally as a local economic center.

Table 3. Value of the Correlation Coefficient between Score Factors of Types of Agriculture Regions and Types of Rural Diversification in Semarang Regency in 2011

Types of Rural Diversification	Agricultural region types			
	AC1	AC2	AC3	AC4
RD1	-0.133	-0.035	0.034	-0.003
RD2	0.002	-0.010	-0.085	-0.046
RD3	-0.152*	-0.097	-0.068	-0.015
RD4	-0.185*	-0.024	0.190**	0.058

Notes:

AC1: Dryland agriculture associated with ruminants

AC2: Wetland agriculture for fruit crops and food crops

AC3: Dryland agriculture combined with inland fisheries

AC4: Dryland agriculture and poultry

RD1: Rural diversification associated with medium and large-scale manufacturing industries

RD2: Rural diversification associated small-scale and household industries

RD3: Rural diversification associated with services

RD4: Rural diversification associated with tourism activities

\*\* : significant at 99 percent, \* significant at 95 percent

Source: Correlation Analysis, 2014.



The correlation between the score factors of the types of agricultural regions and types of rural diversification demonstrates that (1) the rural hinterlands of Semarang Regency as an agricultural region suffers from the lack of linkages between the agriculture and non-agriculture side of their economy, (2) the role of smaller service centres such as district capitals is very limited in facilitating the linkages as part of the role of small service centres has been taken by modern stores, (3) the large-scale manufacturing industries in the regency have limited or no linkages to the rural hinterlands, (3) rather strong linkages between the farm and non-farm side of the rural economy is represented by tourism and fishing.

Apart from the problem of weak linkages between the farm and non-farm side of the rural hinterlands of Semarang Regency, some signs of leakages can be observed clearly when a field observation is made in the market places where farmers and trader met. From the spatial perspectives, a market place can be considered (1) as a hub of collection of agriculture commodities from the farm or smaller markets and (2) as a hub of distribution of agricultural commodities to the rest of the regency and delivers to other farther areas (3) as a hub of livestock distribution from and to the greater areas. All the market places observed have performed as both collection and distribution roles. Three different types of commodity flow from the market places can be identified and these different flows of commodities have different consequences on the rural economy of the regency (Figure 2).

**First**, the flow of agricultural commodities such as vegetables produced in the villages around the market place is brought to the nearby markets. Sumowono and Kopeng Markets are the most significant samples of this type of flow. The amount and type of commodity flow varies depending on the season and the type of crops planted by the farmers. Such patterns of commodity flows occur in almost all district centers. This pattern of commodity flow can be categorized as a short-chain flow because the commodities come from farmers to consumers or to traders in the market and finally are sold by retailers to consumers around the district centers. This type of commodity flow has a neutral effect on the economy of the regency as this represents the flow of commodity from local producers to local consumers only. No significant value added of the commodities are enjoyed by external stakeholders.

**Second**, the vegetables from vegetable-producing villages (11 villages in Sumowono District, 11 villages in Getasan District, seven villages in Bandungan District) are transported to the greater markets. Jimbaran Market is classified as this type of flow. Vegetables and fruits from these markets are further brought to several markets in Semarang Regency, such as Ungaran and Tengarani, to cater to its surroundings. In addition, greater parts of the commodities are sent beyond the regency borders to Salatiga City,

Surakarta, Yogyakarta, and Semarang, Boyolali, Demak, Kudus, Jepara, Kendal, Temanggung and Pekalongan. Commodity flows from these markets are also consumed by people in different areas of Central Java. As the commodity are exported without processing, the value added of the commodity are mostly enjoyed by the external stakeholders. The greater proportion of the unprocessed commodity flow from these market to the area beyond the regency borders, the greater leakages of economic opportunity for the rural people is unavoidable.

**Third**, the flow of livestock from the cattle market to different areas beyond the regency borders and vice versa. The cattle market of the Semarang Regency, precisely in Bawen Market, is the main market place for the regency and its surroundings. From this market, the greater majority of cattle are sent to surrounding districts and municipals in Central Java Province, such as to Salatiga, Surakarta, Semarang, Boyolali, Magelang, Temanggung, Kendal and Purwodadi. In addition, some of them were marketed to several surrounding districts, namely to Ungaran, Tengarani, Tuntang. The available ruminant comes from several livestock-producing villages, such as Kawengen Village, Mluweh, Ungaran Timur District, Kalisidi Village Ungaran Barat District, several villages in Suruh, Bringin, Bancak, Pabelan, Kaliwungu, and Getasan Districts. All of these villages occupy the upland parts of the regency. Again, cattle

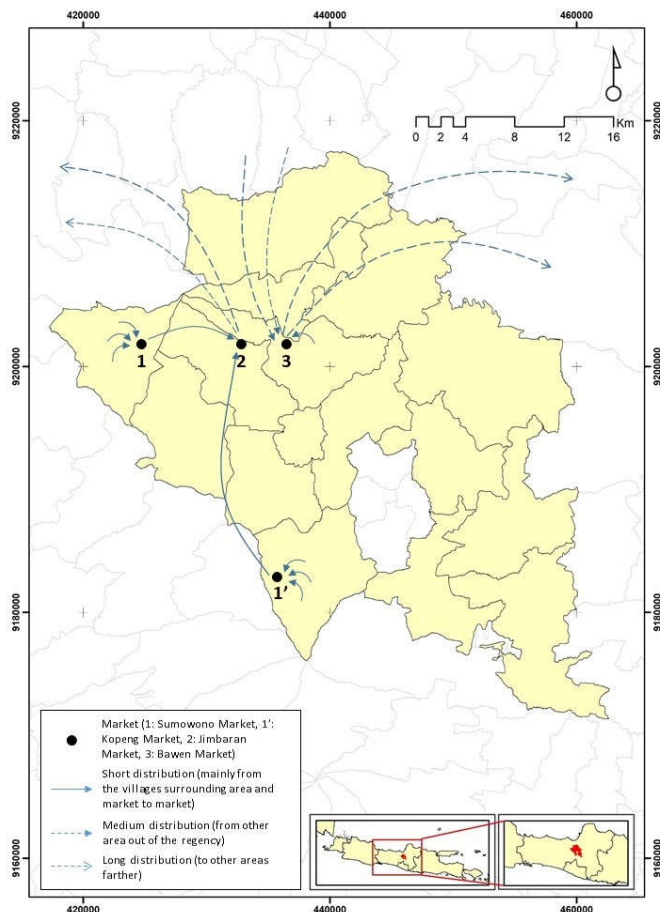


Figure 2. The flow of Agricultural Commodities from Semarang Regency

as agricultural commodities are exported without any processing that the value-added are enjoyed by other regions.

From the three types of commodity flows observed in selected market places, there are two that put the Regency of Semarang as a purely agricultural commodity-producing region. The majority of commodities (such as livestock, vegetables, fruit, and flowers) were marketed to cater external market without any processing. From the point of view of rural development, this is a missing opportunity that can be reconsidered as a new space for livelihood improvement and poverty alleviation through some institutional changes in rural areas.

#### 4. Conclusion

Although the regional income from the processing industry sector, along with its growth, is relatively high for a long period of time, the existence of poor people in this region is still relatively high. This partly shows the weakness or absence of synergistic linkages between agricultural activities in rural areas and non-agricultural activities in its regional economic service centers. In general, the linkages between the agricultural and non-agricultural sectors in this region are very weak, so that the added value of the agricultural sector is enjoyed by people outside Semarang Regency. This situation emerges due to the large volume of agricultural commodities flowing out of the Semarang Regency to neighboring cities and districts without prior processing. Based on the result of correlation values, the proper recommendation that might increase the value of commodities for the village people is that the government needs to restrict the raw/fresh products not to directly flowing out from the village. The products need to be processed in the village or slightly higher level to increase the industrial activity in the village. As a result, the added value of agricultural production from these regions is mostly enjoyed by people in other regions, which also places this district as a purely agricultural area in the negative connotation. Keeping the added value of agricultural commodities in the district will be a new opportunity to improve farmers' livelihoods while helping to reduce poverty. For this reason, institutional changes are needed in agriculture and livelihoods in rural areas, if the greater added value from the agricultural sector is to be enjoyed in this area. Nevertheless, there is evidence of a rather strong link between non-agricultural agricultural activities as indicated by the factor score of dryland agricultural areas associated with ruminants and rural diversification associated with services and factor scores in dryland agricultural areas associated with rural diversified ruminants associated with tourism.

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